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15361804 PMID: 15170832

Radiofrequency power deposition utilizing thermal imaging.
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Magnetic resonance in medicine - official journal of the Society of
Magnetic Resonance in Medicine / Society of Magnetic Resonance in Medicine
(United States) Jun 2004, 51 (6) p1129-37, ISSN 0740-3194
Journal Code: 8505245

Publishing Model Print

Document type: Journal Article

Languages: ENGLISH

Main Citation Owner: NLM

Record type: MEDLINE; Completed

Wavelength effects influence radiofrequency (RF) power deposition distributions and limit magnetic resonance (MR) medical applications at very high magnetic fields. The power depositions in spherical saline gel phantoms were deduced from proton resonance shift thermal maps at both 1.5 T and 3.0 T over a range of conductivities. Phase differences before and after RF heating were measured for both a quadrature head coil and a circular surface coil. A long echo time (TE) pulse sequence with a 3D phase unwrap algorithm provided increased thermal sensitivity. The measured thermal maps agreed with a model of eddy-current heating by circularly polarized oscillating RF fields in a conducting dielectric sphere. At 3.0 T, thermal maps were acquired with a <0.32 degrees C temperature rise at 4 W. Proton resonance shift thermal maps provided a measure of hot spots in very-high-field MR imaging (MRI), in which both the phase sensitivity and signal-to-noise ratio (SNR) were increased. The method provides a means of studying the heat distribution generated by RF coils excited by clinical pulse sequences. Copyright 2004 Wiley-Liss, Inc.

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09545677 Genuine Article#: R9995 Number of References: 10
Title: INCREASED RF POWER ABSORPTION IN MR IMAGING DUE TO RF
COUPLING BETWEEN BODY COIL AND SURFACE COIL
Author(s): BUCHLI R; SANER M; MEIER D; BOSKAMP EB; BOESIGER P
Corporate Source: UNIV ZURICH, INST BIOMED ENGN/CH-8044 ZURICH//SWITZERLAND/
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TECHNOL/CH-8044 ZURICH//SWITZERLAND/
Journal: MAGNETIC RESONANCE IN MEDICINE, 1989, V9, N1, P105-112
Language: ENGLISH Document Type: ARTICLE